

## Adherence to Worksite Exercise Programs: An Integrative Review of Recent Research

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### **Article:**

Exercise has received considerable attention at the worksite in recent years because of its association with reduced risk for cardiovascular and musculoskeletal diseases, obesity, and mental health problems, and its potential for minimizing the negative effects of such chronic conditions as diabetes, osteoporosis, and back pain (Bouchard, 1990; Duncan, 1985; Harris, 1989; Melby, 1988; Powell, 1989; Taylor, 1985). Worksite research documents that improved physical fitness results in fewer worker injuries, fewer absences from work due to illness, and increased worker productivity (Bowne, 1984; Cady, 1979; Hilyer, 1990; Lynch, 1990; Shephard, 1981; Sirles, 1991).

Although physically fit workers may have a decreased risk for certain diseases and injuries, the majority of adults do not exercise regularly. Only 22% of Americans 18 years and older engage in light to moderate physical activity, 12% engage in vigorous activity, and 24% engage in no leisure time physical activity at all (USDHHS, 1991).

One very plausible approach to increasing adult fitness is to offer worksite fitness programs, as working adults spend a major part of their day in the work environment (LTSDHHS, 1991). Support for physical fitness and wellness programs in the workplace comes from both the private and public sectors (Gebhardt, 1990; USDHHS, 1991; U.S. Office of Personnel Management, 1994).

The proportion of worksites offering physical fitness programs has increased over time. For example, companies with 250 or more employees that have organized fitness programs increased from 2.5% in 1979 to 32.4% in 1985 (Karch, 1987). A recent national survey of worksites employing more than 50 people (50% of the work force) found that 42% of the worksites had exercise/fitness activities (USDHHS, 1993). The number of worksites offering physical fitness programs is likely to increase, as occupational settings are identified as a target for employer sponsored physical activity and fitness programs in the health objectives for the nation (USDHHS, 1991).

Despite this rapidly growing interest, participation in worksite fitness programs rarely exceeds 20% of eligible workers, and fewer workers become long term program participants (Morgan, 1984; Song, 1982; Steinhardt, 1989). A certain segment of the worksite population exercises routinely and will do so whether or not the workplace offers a fitness program. Adherence is not an issue for this group. Rather, adherence is an issue for those hard to reach workers who do not routinely exercise on their own. This latter group of workers represents a sizable proportion of the U.S. work force. For a 6 month period, Lynch (1993) found a steady decline of frequency of exercise among employees who joined a worksite exercise facility.

Adherence is important because lasting benefits of a worksite fitness program are more likely when workers participate in the exercise program over time. Programs that incorporate strategies to increase exercise adherence will likely be more successful in terms of worker benefit and employer benefit than those without

strategies. In addition, the worksite has more control over the types of programs and exercise facilities offered to employees. While a number of studies have examined the effectiveness of worksite strategies on exercise adherence, the findings have not been summarized in the literature.

The purpose of this article is to summarize and critique the literature on worksite exercise interventions that sought to increase adherence to exercise. Recommendations about program adherence initiatives and future research also are discussed.

The following questions were addressed in the review of literature on adherence to worksite exercise programs:

1. What were the sample characteristics of worksite studies reporting adherence strategies and exercise behavior outcomes?
2. What research designs were used with these studies?
3. How were the variables, exercise and adherence, measured?
4. What program strategies were used to improve exercise outcomes?
5. What are the study findings?
6. What study limitations need to be considered in drawing conclusions from the reviewed literature?

## **DEFINITIONS AND PHASES OF EXERCISE**

The concept of exercise should be defined so that interpretation and comparisons can be made among studies. The definition of exercise is problematic because physical fitness, physical activity, and exercise are often confused or used interchangeably. According to Caspersen (1985),

exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final . or an intermediate objective the improvement or maintenance of physical fitness.

Exercise that promotes cardiorespiratory endurance, muscular strength and endurance, flexibility, and lean body mass increases physical fitness. Although cardiorespiratory endurance is improved the most by aerobic exercise, all of the components can be improved through physical activity (Heyward, 1991).

### ***Endurance Development***

Physical activities that develop cardiorespiratory endurance are at the heart of an exercise program. Cardiorespiratory fitness is improved by aerobic activities (those using oxygen for energy) (Howley, 1992). Activities such as brisk walking, running, bicycling, rope skipping, and swimming are examples of good aerobic activities. Maximal heart rate, or a person's highest attainable heart rate, can be used to estimate the amount of oxygen needed during a particular type of activity.

According to *Healthy People 2000; National Health Promotion and Disease Prevention Objectives*, light to moderate exercise is physical activity characterized by sustained, rhythmic muscular movements, performed at less than 60% of maximum heart rate for age (USDHHS, 1991). Vigorous exercise is physical activity that uses 60% or greater maximal heart rate for age (USDHHS, 1991). The American College of Sports Medicine (ACSM) (1991) recommends that exercise sustained over 20 minutes, three times a week, at an intensity of 60% or greater maximal heart rate, is necessary to produce health benefits.

### ***Strength Development***

Muscular strength and endurance are increased when the force and repetition are increased beyond what a specific muscle or muscle group normally encounters (Howley, 1992). Many occupational and leisure tasks

(i.e., moving, lifting, or holding heavy objects) require muscular strength and endurance to prevent physiological stress (ACSIVI, 1991).

### ***Flexibility Development***

Flexibility is the ability to move a joint or series of joints smoothly through the complete range of motion (AGSM, 1991). Flexibility is highly specific to a particular joint (Anderson, 1991; Heyward, 1991). Flexibility is improved with specific types of physical activity which result in more elasticity of the muscle and fascia' sheath (Moffatt, 1988). Many experts believe low back pain and back injuries among workers are a result of poor lower back/hamstring muscle flexibility and poor abdominal strength/endurance (ACSM, 1991; Leonard, 1990; Mc-Govern, 1985).

### **DEFINITION OF EXERCISE ADHERENCE**

Participation and exercise adherence have been used to describe the continued act of exercise. In some exercise studies, persons are considered "participants" if they simply obtain membership in a program. Program membership by itself is not likely to improve exercise behavior.

Adherence means habitual exercise behavior (Dish-man, 1988). Individuals are considered to be in a maintenance stage of a behavior (such as exercise) when the behavior is sustained for 6 months or longer (Prochaska, 1992). Dishman (1988) noted that type of exercise, and its frequency, duration, and intensity should be considered in exercise adherence. The authors of this article assert that adherence involves habitual participation in an exercise regimen with the necessary frequency, duration, and intensity, required for health benefits.

### **METHODOLOGY**

The authors conducted a literature search of studies of exercise programs where adherence to exercise was listed as one objective of the study. Sources for the review included *MEDLINE*, *Cumulative Index to Nursing and Allied Health Literature*, *Sport & Leisure Index*, *Sociology of Leisure and Sport Abstracts*, *Physical Fitness/Sports Medicine*, *Psychological Abstracts*, *ABI/ Inform*, *Occupational Safety and Health (NIOSH)*, and ancestry (i.e., tracking relevant Sources for the relevant citations in published words and phrases used in the search were exercise behavior, exercise compliance, exercise adherence, worksite physical fitness program, worksite health promotion, motivation and exercise, and exercise adherence interventions.

Criteria for selection of the review studies included: published research describing worksite exercise programs and specific strategies to improve exercise adherence; and studies examining actual exercise behavior and Not merely intent to exercise. The review was further restricted to articles published from 1980 to the present. Excluded were studies of mandatory exercise programs (e.g., such as some of those for firefighters) and those using simply membership in a worksite fitness program as a measure of adherence.

It is necessary to point out the limitations to the validity, of this review. The review includes only published reports of research and excludes unpublished reports that may include other successful adherence strategies used in worksite settings. Therefore, the unit of analysis, each published study, may not be representative of the population of studies that examined worksite strategies to improve exercise adherence. In addition, the number of published reports is small.

A data collection tool was developed to abstract study elements in a systematic way. Elements included in the review are: author, year and purpose of the study, sample size and characteristics, sampling method, type of research design, measurement characteristics, program strategies, and findings. A summary of these elements is reported in Tables 1-3.

### **RESULTS**

From a pool of 19 studies, 10 studies of worksite exercise programs met the study criteria. They were published between 1982 and 1992, with four published since 1991. The result, are described below.

## ***Research Methods***

Research methods used in the studies can be seen in Table 1. The sample sizes ranged from 51 to 2,147. No study reported the use of a power analysis to determine the sample size needed to detect an effect.

Most of the researchers examined exercise adherence with samples of middle aged, "white collar" workers. Only one study (King, 1988a) specifically examined exercise adherence with "blue collar" workers. Blue collar workers are a group who have been known to be less likely to participate in any worksite health promotion programs (Niknian, 1991; USDHHS, 1984). Studies reporting gender had an overall equal balance of males and females.

All of the subjects for the studies volunteered to participate. Some investigators (Gettman, 1983; Shephard, 1992) included the entire worksite population, and other investigators (Blair, 1986; Song, 1982) used multiple worksites for comparison of study results. In all but one study (King, 1988c), volunteers were recruited specifically for the physical fitness program.

Researchers in only two studies used an experimental design, where subjects were randomized into treatment and control groups (Gettmann, 1983; King, 1988c). Of the four studies using quasi-experimental designs, one (Robison, 1992) used a nonequivalent control group (Cook, 1979) for comparison. Investigators in other studies used a time series design (Cook, 1979) where characteristics of study participants were examined before and after the exercise intervention (Blair, 1986; King, 1988a; Robison, 1992; Stoffelmayr, 1992). In all of the pre-experimental studies, interventions were in place when the study began, and outcome measures were examined at the end of a specified time period (i.e., no pretests were used). (For a description of research designs, the authors recommend Campbell [1963] or Cook [1979].)

All of the studies were longitudinal, which might be expected since the purpose is to observe changes in adherence over time. Most of the studies were conducted over a period of at least 6 months.

Conceptual frameworks were seldom used to guide the research. In studies using conceptual frameworks, Blair (1986) used the public health model as a study framework. McAuley (1991) assessed self motivation and self efficacy as determinants of exercise adherence. King (1988c) described a program using strategies from a relapse prevention model.

## ***Measurement of Exercise***

**Exercise Components.** Patterns of exercise, including frequency, intensity, and duration of activity, are important considerations for determining the quantity and quality of exercise (ACSM, 1990). In all of the studies reporting duration, exercise was done for at least the 20 minutes recommended by the ACSM (1990, 1991) (see Table 2). The authors note that the ACSM (1990) recommends duration be based on intensity of exercise. With vigorous exercise, duration is adequate at 20 minutes. However, if exercise is performed at moderate intensity, duration should be increased to as much as 60 minutes to achieve health benefits (ACSM, 1990).

Intensity of exercise was measured by a number of different methods (see Table 2). Determining energy expenditure from heart rate and converting reported activity to energy expenditure units or metabolic equivalents (METS) are acceptable methods of determining exercise intensity (Ainsworth, 1993; Montoye, 1984). Several investigators referred to "exercise prescription" or "target heart rate," but did not report intensity as a specific measure of energy expenditure (Gettman, 1983; McAuley, 1991; Robison, 1992; Song, 1982; Stoffelmayr, 1992).

Supervised exercise programs were comprised of only aerobic exercises (McAuley, 1991). Those programs that were not supervised included a teaching component so that the subject would understand what activities were considered to be aerobic (Robison, 1992; Stoffelmayr, 1992). All of the studies reporting intensity were in

compliance with the recommendations of the ACSM (1990, 1991) that exercise be at 60% to 90% of maximum heart rate.

TABLE 1  
**Study Characteristics**

<i>Study</i>	<i>Objective Related to Adherence</i>	<i>Sample</i>	<i>Design</i>	<i>Additional Variables</i>
Blair (1986)	Examine for use of the public health model to increase maintenance of exercise habits over a 2 year period	n=2,147; Tx, n=1,399, Johnson & Johnson Co., M/F, volunteers	Quasi-exp., Tx/control (companies) 2 year study	Demographics, job classification
Gettman (1983)	Develop an unsupervised exercise program; to examine adherence, attrition, and training changes; and to compare results with those from a supervised program	n=47; Tx, n=37, police officers, M, age range 36-53, volunteers	Experimental, Tx/control, random assign. 20 week study	Program factors (time, distance)
King (1988a)	Explore methods for increasing leisure time aerobic activity	n=38; Tx, n=22, "blue-collar" employees, M age=44.9, volunteers	Quasi-exp., pretest/posttest, 2 groups, 16 week study	Demographics, years at current job, smoking history
King (1988c)	Evaluate strategies for enhancing adoption and maintenance of home based exercise	Adoption study: Tx, n <sub>1</sub> =29; Tx, n <sub>2</sub> =23 maintenance study: Tx, n <sub>1</sub> =28; TX, n <sub>2</sub> =23 Lockheed Missiles & Space Corp., M/F adopters, M age 49 maintainers, M age 47 volunteers	Experimental Tx/control adoption: 6 month study Maintenance: 12 month study	Not reported
McAuley (1991)	Examine relationships among exercise participation patterns and selected biometric and psychosocial variables	n=58, university employees, F (sedentary), M age=39, volunteers	Pre-experimental, 2 month study	Self motivation, self efficacy, instructor influence
Robison (1992)	Evaluate the effect of behavioral management techniques on exercise adherence	n=137; Tx, n=117, university staff/faculty/grad. students, M/F, volunteers	Quasi-exp., Tx/control (six sites), 6 month study	Perceived exertion
Shephard (1992)	Describe the impact of a company wide fitness program over a 12 year period	Over 10 yr. period: Active group n=104 Sedentary/comparison group n=49 large, Met. Life Assurance Company volunteers	Pre-experimental, 12 year study	Recruitment, employee turnover, absenteeism, productivity
Song (1982)	Evaluate longer term adherence to a fitness program	n=502 (at 18 months) Canada Life Assurance Company, M/F, volunteers	Pre-experimental 18 month study	Absenteeism, reasons for dropping out, employee turnover
Steinhardt (1989)	Examine the effect of social-environmental, physical-behavioral, and psychological factors on early and continued participation in an on site fitness program	n=526, Conoco Company, M/F, volunteers	Pre-experimental 6 month study	Social support, convenience, exercise history, physical ability, attraction/phys. act., self motivation, attitude/commitment
Stoffelmayr (1992)	Develop and test an exercise adherence model that would be affordable and result in high participant adherence	n=159, University worksite, M/F, M age=40, volunteers	Pre-experimental (followed participants for 6 months)	Physiological effects, program satisfaction, rating interventions

*M* = male; *F* = female; *N* = population size; *n* = sample size for exercise adherence data; *M* age = mean age of the sample; *quasi-exp.* = quasi-experimental; *Tx* = treatment group.

In all but the study by McAuley (1991), exercise frequency was set at three or four times a week, an amount acceptable with the criteria set forth by the ACSM (1990, 1991). Stoffelmayr (1992) measured actual exercise frequency as the number of monthly visits to the fitness center. Blair (1986) also used a 7 day recall of actual exercise episodes which included a measure of physical activity frequency (Blair, 1985).



TABLE 2  
**Measurement of Exercise**

<i>Study</i>	<i>Duration</i>	<i>Intensity</i>	<i>Frequency</i>	<i>Physical Activity Measure</i>	<i>Physical Fitness Measure</i>
Blair (1986)	Not reported	75% max. heart rate energy expenditure (kcal $\times$ kg <sup>-1</sup> $\times$ day <sup>-1</sup> )	Not reported	Self report: global, past 3 months, 7 day recall	VO <sub>2max</sub>
Gettman (1983)	15 min. warm-up, 30 min. aerobic	Recorded heart rate, target not specified	3 $\times$ /week	Self report	VO <sub>2max</sub> , recovery heart rate, % body fat
King (1988a)	30 minutes	Exercise prescription, 70-80% max. heart rate	3 $\times$ /week	Self report Verification by others	not reported
King (1988c)	Maintenance: not reported, Adoption: 30 minutes	Maintenance: not reported, Adoption: 65% max. heart rate	Maintenance: not reported Adoption: 4 $\times$ /week	Self report	Perceived exertion
McAuley (1991)	60 minutes	Target heart rate	2 $\times$ /week	Self report	Body weight, % body fat
Robison (1992)	30 minutes	Target heart rate, exercise prescription	4 $\times$ /week	Self report Verification by others	VO <sub>2max</sub> , B.P.
Shephard (1992)	Not reported	Not reported	Not reported	Attendance patterns	VO <sub>2max</sub> , % body fat, flexibility
Song (1982)	30 minutes	Exercise prescription	Up to 3 $\times$ /week	Session attendance	% body fat, treadmill time
Steinhardt (1989)	Not reported	Not reported	Number of monthly visits	Session attendance	VO <sub>2max</sub> , perceived exertion
Stoffelmayr (1992)	30 minutes	Exercise prescription, activities predetermined to be aerobic, target heart rate (monitored by heart rate monitor)	4 $\times$ /week	Self report Verification by others	not reported

Frequency, intensity, and duration of exercise are interrelated. All three factors should be considered when determining an exercise prescription that will produce cardiorespiratory fitness and weight control (ACSM, 1990). For example, when intensity is lower, frequency and duration should be increased. Exercise using lower intensity but longer duration and exercise using higher intensity but shorter duration will result in similar physical benefits (ACSM, 1990). No study included in this review made this distinction.

**Data collection of exercise.** Exercise data were collected by self report and by attendance at exercise classes of fitness centers. Blair (1986) was the only investigator using both a global measure of past physical activity and a more specific measure of physical activity and exercise over the previous 3 months. Verification of exercise by another person also was used (King, 1988a; Robison, 1992; Stoffelmayr 1992).

**Measurement of physical fitness.** Because exercise results in outcomes of physical fitness, the components of physical fitness (cardiorespiratory endurance, muscular strength and endurance, flexibility, and body composition) are also appropriate measures of exercise behavior. All but two studies (King, 1988a; Stoffelmayr, 1992) used some component of physical fitness as an outcome measure.

The most frequently used measure of physical fitness was maximum oxygen uptake (VO<sub>2max</sub>). VO<sub>2max</sub> is considered the most valid measure of cardiorespiratory function (Heyward, 1991). Percent body fat also was used as a measure of physical fitness (Gettman, 1983; McAuley, 1991; Shephard, 1992; Song, 1982). Only one study used flexibility as a measure of physical fitness (Shephard, 1992).

### ***Measurement of Exercise Adherence***

Exercise adherence was measured in a variety of ways, and some studies used more than one measure of adherence (see Table 3). Adherence was measured by actual exercise performed (Blair, 1986; Gettman, 1983; McAuley, 1991) and the fulfillment of predetermined goals (Robison, 1992; Stoffelmayr, 1992). Logs or diaries were also used to record exercise episodes (Gettman, 1983; King, 1988a, 1988c; McAuley, 1991; Robison, 1992; Stoffelmayr, 1992).

In other studies, adherence was measured by attendance or participation in an exercise class or fitness center (King, 1988a, 1988c; McAuley, 1991; Shephard, 1992; Song, 1982; Steinhardt, 1989) and through direct observation (McAuley, 1991; Shephard, 1992; Song, 1992).

### ***Program Strategies***

Interventions to improve exercise adherence can be categorized as person oriented, situation oriented, and exercise oriented strategies. Person oriented strategies are those interventions aimed at improving motivation and personal control. Situation oriented strategies include environmental or program components that facilitate exercise adherence. Exercise oriented strategies include characteristics of the exercise regimen that optimize behavioral adherence.

As documented in Table 3, many programs used more than one strategy to increase exercise adherence. While many investigators (Blair, 1986; Shephard, 1992; Song, 1982; Steinhardt, 1989) analyzed data from existing health promotion programs or on site fitness centers, others (Gettman, 1983; King, 1988a, 1988c; McAuley, 1991; Robison, 1992; Stoffelmayr, 1992) developed an exercise program specifically for the study period. All of the programs included a health screen with cardiovascular fitness measures prior to the exercise intervention.

**Person oriented strategies.** There is evidence that personal behavior interventions such as social support, goal setting, planning, and monitoring have been more effective in promoting exercise adherence than health education efforts alone (Dishman, 1990). Prompts and reminders included telephone contacts for those who were not adherent (King, 1988c) and display of posters and exercise charts in the worksite (King, 1988a). Group exercise programs, such as those of Gettman (1983) and Robison (1992), and keeping an exercise log or diary (McAuley, 1991; Steinhardt, 1989), often serve as a reminder to exercise. Other strategies included health counseling to initiate or maintain regular exercise (Blair 1986; King, 1988a; Steinhardt, 1989). Reinforcements in the form of lotteries and other incentives also were used (Robison, 1992; Stoffelmayr, 1992).

Self control interventions included goal setting (Robison, 1992; Stoffelmayr, 1992) and relapse prevention training (King, 1988c). Essentially, participants were taught to identify high risk situations that might lead to lapses in the exercise regimen and how to cope with lapses should they occur (King, 1988c). Feedback from others (Blair, 1986) and self monitoring (Stoffelmayr, 1992) also were used as exercise incentives.

**Situation oriented strategies.** Inconvenient exercise programs can have a negative effect on initial participation and longer term adherence (King, 1991). In addition, exercise programs that allow the individual to exercise on one's own as well as in a structured class have been shown to improve adherence (Dishman, 1985; King, 1988b). Among the studies reviewed, exercise programs were frequently offered at the worksite with no cost to the employee. Employees also had a choice of using on site or community based exercise facilities (Blair, 1986; Shephard, 1992) or of exercising on their own (McAuley, 1991; Song, 1992). Social support by group members and the exercise leader also were used as adherence strategies (Robison, 1992; Stoffelmayr, 1992).

**Exercise oriented strategies.** An exercise regimen at a level that produces health benefits without undue effort has been related to adherence (Dishman, 1988; Sallis, 1986). Low to moderate intensity exercise or slow progression of intensity were used to increase adherence (King, 1988c; McAuley, 1991). Other studies tailored the exercise program to personal preference (King, 1988a; Shephard, 1992) and physical ability (Shephard, 1992; Song, 1982).

## Study Results

All but one study (Gettman, 1983), and this was a small study ( $n=84$ ), demonstrated that exercise adherence strategies worked to increase or improve exercise behavior (see Table 3). Only three studies used statistical analysis to detect significance between those who were "good" attendees and those who were "poor" attendees of exercise sessions (King, 1988a, 1988c; McAuley, 1991). While varying time frames, samples, and measures make comparisons across studies difficult, some general observations can be made.

TABLE 3  
**Measurement of Adherence, Program Strategies,  
and Study Results**

<i>Study</i>	<i>Measure of Adherence</i>	<i>Program Strategies</i>	<i>Results</i>
Blair (1986)	Maintenance of vigorous physical activity and exercise over a 2 year period	Annual health screen + counseling, 3 hour seminar/exercise, on site exercise program part of a larger health promotion program	Vigorous activity by year 2: Health screen only: $M=19\%$ , $F=7\%$ ; Health promotion program: $M=28\%$ ; $F=19\%$
Gettman (1983)	Exercise episodes	Supervised and unsupervised exercise; 4 week group training	Supervised: 55% exercise, Unsupervised: 65% exercise, Control: 70% exercise
King (1988a)	Exercise sessions	Fitness assessment + consultation, recommendation for lifestyle changes, personal preference to exercise, public display of prompts	Participation: 23%, Group differences: $t(24)=2.99$ ( $P<.006$ ). There was a significant difference on exercise bouts between attendees and non-attendees
King (1988c)	Exercise sessions	Self directed behavioral strategies (relapse prevention), monitoring with logs, phone contact/reminders, lower intensity exercise	Adoption study: +phone: $X=12.4 (\pm 6)$ sessions, average duration 32 min.; -phone: $X=9.8 (\pm 8)$ sessions, average duration 28 min. (not sig./+); Maintenance study: daily log: $X=11.4 (\pm 6)$ sessions, average duration 37 min.; weekly log: $X=7.5 (\pm 6)$ sessions (duration not reported) (sig. + $P<.01$ )
McAuley (1991)	Total sessions attended + total exercise bouts	Low impact supervised aerobic classes, self kept log	"Good attendees": 14 sessions, 29 exercise bouts; higher self efficacy; influence of instructor sig. more important; "Poor attendees": 5.9 sessions, 13.1 exercise bouts
Robison (1992)	Individual fulfillment of contractual agreement of 4 exercise bouts/week	Lottery, contracting, monetary incentive, team competition	Tx group: 97% adherence, comparison: 19% adherence, drop outs: 3 in Tx. group, 5 in control group ( $P<.01$ )
Shephard (1992)	>2 exercise class sessions/week	Healthy lifestyle environment, weekly exercise classes, competitions, on site program, planning involvement	Initial: 50% attended sessions, 7 year: 27% attended sessions, 12 year: 13% attended sessions, 7 year cumulative drop out rate: 43.4%
Song (1982)	Attending up to 3, 30 minute sessions/week, low adherence attended an average of <2 sessions/week high adherence attended an average of >2 sessions/week	Supervised, moderate intensity aerobics, personalized exercise prescription, on-site program	High adherent group: 30% remained high, 33% became low, 36% dropped out; Low adherent group: 44% remained low, 4% became high, 52% dropped out
Steinhardt (1989)	Frequency of monthly visits at 1 month and at 6 months, number of visits from computer data	Fitness evaluation + consultation, facility orientation, exercise log, health ed. programs, on site facility	Non-adherers at 6 months = 47%, exercise 3 x/week = 10%, convenience important at 1 month and at 6 months
Stoffelmayr (1992)	Exercising 4 x/week/contract	Exercise prescription, self plans, contracts, group competition, self monitoring, social support, \$ incentive	98% of non-drop outs fulfilled contract, 15% drop out rate

*X* = mean; sig. = statistically significant

The most impressive results were from programs having multiple interventions (Robison, 1992; Stoffelmayr, 1992). A competitive strategy and financial incentive resulted in adherence rates of 97% to 98% (Robison, 1992; Stoffelmayr, 1992). It has been thought, however, that "though monetary incentives and team competition may increase motivation to adhere, these factors also may increase the incidence of false reporting" (Robison, 1992). Exercise fitness programs located in a worksite did not demonstrate greater improvement in fitness over smaller programs that encouraged people to exercise on their own. One unique study (Stoffelmayr 1992) focused the intervention on the worksite population rather than on a selected study sample and showed very positive results.



In general, as expected, studies carried out over a shorter period of time (6 months or less) had higher exercise adherence percentages than did studies over longer periods of time. The 12 year study reported by Shephard (1992) provided excellent data on exercise adherence over time. In this study (Shephard, 1992), exercise adherence was 50% initially, dropping to 27% at 7 years and to 13% at the end of 12 years.

The issue of relapse and strategies to reduce relapse are important to consider. Although the study by King (1988c) was of rather short duration, there is evidence that relapse training followed by an intervention in the form of personal reminders reduces this "dropping off" of adherence to exercise.

### *Study Limitations*

Selection bias is a primary threat to the internal validity of worksite health promotion studies (Conrad, 1991). Only two of the studies addressed the possibility of selection bias (Blair 1986; Stoffelmayr, 1992). Blair (1986) compared respondents and nonrespondents and found them to be similar. Stoffelmayr (1992) examined the characteristics of nonparticipants as well as participants. The examination showed that initially the majority of participants were sedentary and that there were no significant differences in health habits between the two groups (Stoffelmayr 1992).

Just as selection bias can explain group differences, so can subject attrition. Attrition is a problem because those remaining may not be representative of the original study population anymore. A differential loss of subjects from comparison groups may render the groups nonequivalent even in the true experiment (Campbell, 1963). With differential loss, there may be some factor related to the treatment situation (or control situation) that causes individual members of one group to drop out differently than the other group.

People who selectively drop out of one group may have different characteristics than those who drop out of the other group. This selective dropping out produces groups that, although initially identical, become different. Even when dropout rates are the same for treatment and control groups, it is still possible for the groups to be different if something about the treatment situation renders differences in characteristics between the treatment and control groups (Campbell, 1963).

Attrition was reported in only two studies (Blair, 1986; Gettman, 1983). The attrition rate for the treatment and control groups in a study of police officers was 45% and 35%, respectively (Gettman, 1983). The higher adherence to exercise in the unsupervised control group may have been a result of an uneven loss of subjects, rendering the treatment and control groups non-equivalent. On the positive side, Blair (1986) examined those persons who dropped from both the treatment and control groups. No differences were found that would affect the study outcomes, providing some evidence that attrition bias was not a limitation in this study (Blair, 1986).

Studies that used participation in an exercise program as a measure of exercise adherence did not assess the possibility that people may be exercising on their own and not recording these exercise episodes. Shephard's (1992) study found that over a 12 year period, attendance patterns decreased. Although there was a significant change in flexibility and percent body fat, there was no difference in aerobic power after a 7 year period. The possibility that people may be exercising on their own also may have occurred in the studies of Steinhardt (1989), who found that after 6 months there was little difference in change in percent body fat between the attendees and nonattendees, and in the study by Song (1982), who found that low adherents had surprisingly high cardiorespiratory endurance scores.

Statistical conclusion validity is the statistical accuracy of conclusions about relationships between two or more variables (Cook, 1979). Although there are other reasons for threats to statistical conclusion validity, the possibility of unreliable measures and low statistical power are particularly important to the studies in this sample.

Four studies were susceptible to low statistical power because their sample sizes were quite small (Gettman, 1983; King, 1988a; McAuley, 1991; King, 1988c). Statistical power could not be evaluated in these four studies because treatment effects were not provided.

Reliability of the measures used to assess participation in exercise programs, exercise patterns, or physical fitness was not provided. Protocol for exercise and/or fitness testing was described in detail only in the studies of Blair (1986) and Robison (1992). Measures of instrument validity were not provided by one of the investigators. Blair (1986) provided references to the validity of physical fitness and exercise measures. Exercise behavior was validated with physical fitness measures in all 10 studies.

Compensatory rivalry may have been operating in the one study that did not demonstrate improved adherence to exercise from the adherence strategy (Gettman, 1983). The study result was a more positive exercise adherence outcome in the control group (Gettman, 1983). Compensatory rivalry occurs when social competition is generated from known assignment of persons to treatment and control groups (Cook, 1979). It is plausible that the police officers randomly assigned to the control group competed with those in the treatment group. Competition, then, may have served as the motivating factor in exercise behavior in the control group.

## **DISCUSSION**

With the exception of the unexpected findings of one study (Gettman, 1983), a variety of adherence strategies appeared to positively affect exercise among workers. However, very few studies examined specific strategies aimed at improving adherence by carefully controlling for extraneous variables. Clearly, more carefully controlled studies are needed to establish intervention effectiveness, dose response, and mechanisms of action for a variety of occupational groups.

To achieve greater success in improving adherence and reach the objectives for worker fitness by the year 2000, there must be more process studies examining effective means to assist workers to exercise and to incorporate exercise behavior into their normal activities of living. Few investigators examined long term results (i.e., beyond 1 year). It is unclear whether the short term results showing the effectiveness of the various strategies hold over time. Comparing short term studies with the few studies that did report long term results provides evidence that strategies for improving exercise adherence did have a short term effect, but long term, effects were no better than for exercisers in the general population.

One concern raised by this review of worksite exercise programs is that by emphasizing behavioral strategies, environmental and individual factors that influence exercise behavior may have been ignored. Longitudinal and follow up studies are needed to examine the individual worker, the worksite environment, and the intervention as they are related to adherence of exercise.

The majority of research focuses on white collar employees, many of whom may already have exercise habits. Different types of workers will probably require different assistance and incentives to adhere to an exercise program. More studies examining different populations of workers, e.g., blue collar workers, women, and minority populations, are needed to detect these differences so that more efficient programs can be incorporated into worksites.

Standards are necessary for quantifying physical activity and adherence. Without consistent operational definitions and measures for exercise and adherence, study results are less comparable. Exercise frequency, intensity, and duration should be clearly defined and measured to adequately examine intervention strategies and lasting health benefits. As well, the appropriate combination of objective physical outcomes such as  $\text{VO}_{2\text{max}}$ , blood pressure, or heart rate needs to be determined and assessed for accuracy.

Further, all physical activity in a worker's life needs to be considered. A worker who drops from an exercise program may be exercising alone or with another group. Finally, studies that examine the level of adherence in

the treatment group in relation to the dropout rate would provide valuable information for future strategies. Workers may differentially drop out of an exercise program based on their levels of adherence.

Research designs that identify the efficacy of particular strategies for promoting adherence to exercise are needed. Experimental and quasi-experimental designs are essential when examining the effect of a specific intervention (or combination of interventions) on exercise adherence. Although experimental designs maximize internal validity by ruling out such threats as selection bias and subject mortality, these designs raise questions about external validity (i.e., generalizability of the results) and the ethics of randomizing people into treatment groups, withholding an intervention that may be effective for everyone.

Since specific research designs are not a focus of this article, the authors recommend Campbell (1963) for a review. The authors also refer to the study by Robison (1992) as an example of a high quality exercise adherence study using a quasi-experimental design. The study used multiple treatment sites (i.e., groups) with and without exercise incentives. This type of design allowed the effects of specific exercise adherence strategies to be determined in a natural worksite setting.

Exercise, like all behaviors, requires time to become a habitual behavior. A program designed to change exercise behavior must not only consider each of these stages in matching an intervention with an individual worker, but should consider lapses and relapses of the worker going through a behavior change. Individualized strategies should consider identification of relapse, coping strategies, and methods of getting workers back into programs once they become nonadherent. The worksite appears to be an ideal situation for assisting a worker in coping with behavior change, as the worker is at work for much of the time.

Theoretical models to explain and predict adherence to exercise would be useful to identify causal and intervening variables. Model building is a very efficient way to develop strategies for behavior change and to build new knowledge in the area of exercise adherence specific to the worksite.

## CONCLUSION

The worksite has evolved as a venue for health promotion programs that attempt to reduce employees' risk behaviors and encourage positive health practices. Because workers represent a large proportion of the U.S. population, the worksite is a feasible setting for increasing exercise behaviors. Future studies need to incorporate adherence strategies into their programs and carefully evaluate which strategies work best for which groups of workers.

Although relatively few worksite exercise adherence studies have been done, the results are encouraging. Several strategies did appear to enhance adherence to an exercise program, at least for a short period of time. Individual counseling following a physical fitness examination demonstrated an impact on the initiation of exercise and at least the beginning of continued exercise. Educational efforts focusing not only on benefits of exercise, but also on the types of activities considered to be exercise and specific strategies to continue an exercise program, also were important.

Making exercise a more pleasurable part of the work environment showed positive results on adherence in many studies. Prescribing exercise at an intensity, frequency, and duration that an individual can successfully accomplish decreases the negative reactions to beginning exercise behaviors. An exercise program also can be made more enjoyable by rewards and positive support from exercise leaders, management, and coworkers. Finally, some people may simply forget to exercise, especially when the behavior is new. Initiatives such as public displays and personal contact were shown to be effective reminders to continue with an exercise program.

It appears that careful planning of interventions to increase adherence to exercise will increase the number of workers who exercise regularly. It is through these planned efforts that the worksite can be appreciated as a valuable mechanism for increasing worker exercise as outlined in the health objectives for the nation.

## **Adherence to Worksite Exercise Programs**

### **An Integrative Review of Recent Research.**

*Blue, C.L., & Conrad, K.M.*

*AAOHN Journal 1995; 43(2):76-86.*

- 1.** Improving worker physical fitness through worksite exercise programs offers many benefits to the employee and the employer. Unfortunately, a small percentage of workers who begin an exercise program adhere to it.
- 2.** It is essential to design program strategies to promote exercise adherence among persons who do not currently exercise at levels that achieve health benefits.
- 3.** The results of this review of worksite research suggest a number of strategies that were successful in increasing at least short term exercise adherence.
- 4.** Carefully controlled studies are needed to identify specific worksite exercise interventions or combination of interventions that maximize the initiation of exercise as well as short and long term adherence. A combination of strategies improves exercise adherence for at least 6 months, but more research is needed to determine long term maintenance of an exercise program.

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